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ABSTRACT

A demonstration project was undertaken to determine whether 1978 telefacsimile technology could address public library needs in a cost-effective manner. The TALINET project involved local public library staff in five developing communities in Colorado, Kansas, Montana, South Dakota, and Wyoming, as well as research/resource information staff at the University of Denver who researched questions from the public libraries and delivered information to them via telefax. This report describes the dissemination of the findings and implications of the TALINET project and reviews further experimentation with the Qwip II, a more advanced telefacsimile machine. Report appendices comprise: (1) the agenda and list of participants in a 1979 TALINET Regional Conference which was entitled "TALINET: Exploring Telefacsimile for Library Applications"; (2) the conference's keynote address by Norman H. Kreisman entitled "Telecommunications--Libraries and the Future"; and (3) a paper entitled "A Baker's Dozen of Telecommunications Technologies: Capsule Descriptions for the Layman," which describes audio teleconferencing, video teleconferencing, computer conferencing, slow scan television, facsimile, the Electronic Blackboard, TTY (teletypes for the deaf), closed captioning of television, teletext and viewdata, subcarrier (SCA), instructional television fixed service (ITFS), cable television, and satellite networking; it also lists the strengths and weaknesses of video teleconferencing, computer conferencing, audio teleconferencing, and face-to-face conferencing. (ESR)

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TELEFAX LIBRARY INFORMATION NETWORK

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Talinet II
Continuation Grant

Graduate School of Librarianship and
Information Management
University of Denver
1979

IR050184

TALINET II
REPORT OF CONTINUATION GRANT

HEW GRANT 0328-7901
OFFICE OF TELECOMMUNICATIONS POLICY
OFFICE OF THE ASSISTANT SECRETARY
FOR
PLANNING AND EVALUATION

September 1979

The research report herein was performed pursuant to a grant from the U.S. Department of Health, Education and Welfare, Washington, DC. The opinions and conclusions expressed herein are solely those of the author, and should not be construed as representing the opinions or policy of any agency of the U.S. Government.

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APPENDIX

TALINET II

Upon completion of the original TALINET Demonstration Project, March 15, 1979, the Graduate School of Librarianship and Information Management of the University of Denver was awarded a six-month follow-on grant by the Office of Telecommunications Policy of the U.S. Department of Health, Education and Welfare. This grant was designed to disseminate the findings and implications of the TALINET Project and to explore possibilities for implementing telefacsimile in library services in the Western states.

WORK PLAN

The work plan for the follow-on project included the following:

1. A two-day regional conference which would include representatives from the TALINET site libraries, five state librarians and appropriate state library staff members, the TALINET Advisory Board, and representatives from the Denver-based Bibliographical Center for Research and the Seattle-based Pacific Northwest Bibliographic Center.

2. Presentations at: the American Library Association meeting in Dallas, Texas; a meeting with the Utah State Librarian and 20 selected librarians from throughout the state of Utah; the Pacific Northwest Library Association meeting in Boise, Idaho; a meeting with Spokane area librarians in Spokane, Washington; and a meeting of the Colorado Association of Research Librarians in Denver.

3. Development of a foundation grant proposed by the Bibliographical Center for Research, MINITEX, and the Pacific Northwest Bibliographic Center to conduct an in-depth survey in 19 Western states. The purpose of the survey will be to determine the numbers, kinds and compatibility of present and proposed telefacsimile equipment, the availability of FTS, WATS, and other telephone lines, the availability of TWX and computerized communications equipment and the immediate plans for installing and using any of the above.

4. Permission was requested and granted by HEW to extend the grant period to November 30, 1979, in order to make presentations at the following conferences:

   - Public Service Satellite Consortium Annual Meeting, Washington, DC, October 10-12, 1979;

   - Mountain Plains Library Association Annual Meeting. Denver, Colorado, October 28-31, 1979;

   - Continuing Library Education Network and Exchange (CLENE) meeting, Santa Fe, New Mexico, November 8-13, 1979.

5. Qwip II: During the final stages of the TALINET Demonstration, Qwip produced an improved model, the Qwip II Series 1300, which operates in 2- and 3-minute modes. It was felt that this model should be compared with the Qwip 1200 and the Rapifax 100 in order to provide the most current cost and efficiency comparisons available during the TALINET grant period. The staff conducted experimentation with Qwip II and the results are included in this report.

TALINET REGIONAL CONFERENCE

As one element of the second grant the TALINET Project staff planned and conducted a two-day conference--"TALINET, Exploring Telefacsimile for Library Applications"--on July 15 and 16, 1979. Invitations to participate in this conference were extended to the Library Directors and Site Coordinators from the five TALINET site libraries, the State Librarians and Directors of regional library systems in the five TALINET states, the TALINET Advisory Committee, and the Executive Directors of the Bibliographical Center for Research and the Pacific Northwest Bibliographic Center. A complete list of conference participants may be found in the Appendix.

The objectives of the conference were:

1. To present and examine the findings of the TALINET Project;

2. To create an awareness for all conference participants of existing or projected networking activities in the states of Colorado, Kansas, Montana, South Dakota, and Wyoming;

3. To develop an awareness of new and developing technologies in telecommunications that are applicable to library use; and

4. To stimulate discussion of the possibilities of implementing a telefacsimile information network in the Mountain Plains and Pacific Northwest Regions.

The conference opened with a keynote address, "Telecommunications--Libraries and the Future," delivered by Mr. Norman Kreisman, President of VideoFax, Inc. Following his address the TALINET staff presented an overview of the TALINET Project's operations and findings and discussed the cost considerations for library application of the two pieces of telefacsimile equipment employed by the Project.

Conference attendees caucused by state and selected one of their number to present to the whole conference an overview of that state's present library networking activities, future directions, and areas of concern. Although there were significant differences among the states in their present levels of networking activities and their intended future directions of development, some common areas of concern emerged from these reports. These included:

1. Rising costs of library materials and services;

2. The need for improved bibliographic access to library-owned materials;

3. The desire to speed up the delivery of library materials to library users;

4. The need to improve the efficiency and effectiveness of accessing existing resources.

On the morning of the second day, the Executive Directors of the Bibliographical Center for Research and the Pacific Northwest Bibliographic Center presented similar reports from their agencies. Their concerns paralleled those expressed by the states.

Following these reports, a discussion of new and imminent developments in telefacsimile and other telecommunications technology of possible application to library use was led by Dr. Joan Maier of the National Oceanic and Atmospheric Administration (NOAA) Library in Boulder, Colorado. The new Qwip II being tested by TALINET was also demonstrated and test results comparing this machine with the Qwip 1200 used during the TALINET demonstration were distributed.

The entire conference was then divided into three groups to discuss various possible applications of telefacsimile technology and develop models for potential operations. One group attacked the problem from the viewpoint of applications and operations within a single state; a second group took a regional (interstate) approach, while the third group explored network possibilities based on resources, with no regard to state or regional boundaries.

Reports were delivered by each of these groups in the afternoon. The state group reported the following conclusions:

1. Telefacsimile technology, with its current cost, is not now feasible for smaller libraries. The most practical use of the technology would be its placement at major switching centers within each state, to provide interstate access and access to major resources.

2. Any future interstate developments in library networking should rely on the regional service agencies--the Bibliographical Center for Research and the Pacific Northwest Bibliographic Center--to function as coordinators to assure an equitable distribution of requests to various resources and to coordinate any interagency/interstate payments required.

3. Any adoption of telefacsimile or other telecommunications technology within the region should consider future equipment compatibility.

4. The highest priority concern for resource sharing within the region is the development of a Regional Union List of Serials.

The regional group reported on the need to use existing systems and modes of resource sharing more effectively and efficiently, while examining current protocols and developing new ones with an eye to accommodating or facilitating the use of new technologies. This group, like the state group, felt that telefacsimile would be most useful as a communication tool among major regional resource centers.

A number of a priori issues for examination were raised by the resource group. These addressed themselves to:

the technology--
- how to assure machine compatibility,
- whether to use telefax for communication or for document delivery

the nature of resource centers--
- how should a center be defined
- how to identify centers
- how formal should designation be
- what subject areas need to be covered

to the nature of information requests--
- how large is the volume of resource sharing
- what is the volume and nature of failure to provide needed information
- how important is time
- how is the importance of time likely to change in the future

and to interagency relations--
- how are these relationships changing
- how are they likely to change

This group also expressed the sentiment that telefacsimile was currently too expensive for small libraries, and in light of the a priori issues raised, they did not recommend its use among regional resource centers.

Following the group reports, a summary discussion was held with generated the following concensus:

1. That telefacsimile delivery should be considered as a viable methodology to be added to current document delivery methods;

2. That TALINET was a useful demonstration and that it should now be the concern of the states and major library service agencies to use the results as a basis for future implementation efforts;

3. That there is a variation within the region in terms of equipment compatibility, telefacsimile experience, telephone resources, resource information nodes, and the protocols for accessing information;

4. That prior to implementing or planning for telefacsimile impiementation, a regional survey/study needs to be accomplished to identify the regional assets and constraints that exist in each of the areas listed in No. 3, above.

5. In light of the foregoing decisions, a second implementation conference should not be scheduled, but rather the TALINET staff should: continue to disseminate the project

findings during the remainder of project time; work with Pacific Northwest Bibliographic Center, Bibliographical Center for Research, and other similar agencies to develop a strategy for identifying the regional assets and constraints; and develop a strategy for moving from a demonstration mode to a limited regional operation.

UTAH STATE LIBRARY PRESENTATION

Contact was made with the Utah State Librarian, and a request was made for the TALINET staff to make a presentation of the TALINET findings to a select group of librarians from throughout the State of Utah.

On August 21, 1979, four TALINET staff members made a presentation at the State Library in Salt Lake City, Utah. Twenty-four representatives from a variety of libraries were in attendance. Represented were the Utah State Library, county libraries, several college libraries, a law library, and a health sciences library.

The presentation covered project development, the demonstration findings, cost-benefit information, and implications for the future.

During the discussion which followed the presentation, a telefacsimile mini-system utilized in the county surrounding Salt Lake City was discussed. It was felt by the group that pending a larger system development (multistate or regional) that this network could be expanded to provide economical document delivery in the Salt Lake City-Ogden-Provo, Utah area. Libraries located in more remote areas of the state expressed interest in having access to such a development. Of general concern to everyone was the initial outlay required to purchase equipment, especially in a time of reduced budgets and resources. The idea of developing a series of grant applications designed to study regional telefacsimile related information, systems modeling, and implementation phase was met with approval.

It was felt by the TALINET staff that the Utah meeting will encourage increased telefacsimile activity and new cooperative arrangements within the State of Utah.

PACIFIC NORTHWEST LIBRARY ASSOCIATION MEETING

The Assistant Director of the TALINET Project attended the annual conference of the Pacific Northwest Library Association in Boise, Idaho, on August 21, 22, and 23, 1979. Informal contact was made with conference attendees and two meetings were held on August 21 and 22, 1979, to present the activities and findings of the TALINET Project. Approximately 70 individuals attended these meetings to discuss the Project and its implications for telefacsimile application to the delivery of library services. A specially prepared 15-page summary of the TALINET Project Final Report was distributed at these meetings; 55 copies were distributed. Librarians attending these meetings represented the following organizations:

Idaho State Library
Washington State Library
Pacific Northwest Bibliographic Center
Kitsap Regional Library System (Bremerton, Washington)
Timberland Regional Library System (Lacey, Washington)

Southwest Idaho Regional Library System (Boise, Idaho)
Boise State University Library
Montana State University Library
Portland State University Library
Spokane Community College Library
University of Idaho Library
Boise Public Library
Moscow-Latah County Library System (Moscow, Idaho)
Nez Perce County Free Library (Lewston, Idaho)
Lewis and Clark Library (Helena, Montana)
Bellingham Public Library (Bellingham, Washington)
King County Library (Seattle, Washington)
Seattle Public Library (Seattle, Washington)
Spokane Public Library System (Spokane, Washington)
Spokane County Library System (Spokane, Washington)
Sandpoint/Bonner County Library. (Sandpoint, Idaho)

Most persons approached at the conference were very interested in the Project and its findings and many practical questions were asked. Two academic libraries--Portland State University and Montana State University--were especially interested in the cost findings as they both indicated they have document delivery needs that might make telefacsimile an attractive delivery method for them.

SPOKANE LIBRARIES

On August 24 and 25, 1979, the TALINET Project Assistant Director also had an opportunity to talk with librarians of the Spokane County Library System, the Spokane Public Library, and the Central Valley School District in Spokane, Washington, and give them copies of the 15-page summary report.

COLORADO ACADEMIC RESEARCH LIBRARIES (CARL) PRESENTATION

On August 24, 1979, a presentation was made to research librarians and Directors representing CARL. The libraries represented were the Auraria Higher Education Center Library, Colorado School of Mines, Colorado State University, the University of Northern Colorado, the University of Colorado, the University of Denver, and the Denver Public Library.

The presentation included a presentation of the TALINET Demonstration, the findings, cost analyses, and a discussion of how the TALINET findings could affect the operation of the CARL system of cooperative interlibrary activities.

CARL presently operates a courier system over a 200-mile route. This is a costly operation which is becoming more costly as energy costs increase. The CARL representatives were very interested in the TALINET cost figures for the telefacsimile document delivery. The TALINET costs can be dramatically decreased in the CARL operation since all telephone costs can be at local rates with no long distance charges required in normal CARL system operations.

CARL leadership indicated an interest in continuing the telefacsimile discussion and in developing comparative costs for introducing telefacsimile into the system.

FUTURE MEETINGS

The results of presentations to be made in conjunction with the following meetings will not be made in this report due to their timing and the timing of the publication of this report. The following three meetings will be reported to HEW, Office of Telecommunications Policy, at the end or the TALINET II grant period on November 30, 1979:

1. Public Service Satellite Consortium Annual Meeting, Washington, DC, October 10-12, 1979;

2. Mountain Plains Library Association Meeting, Denver, Colorado, October 28-31, 1979;

3. Continuing Library Education Network and Exchange (CLENE) meeting, Santa Fe, New Mexico, November 8-13, 1979.

QWIP II STUDY

As the TALINET Project was completing its Demonstration period in March, 1979, Exxon Corporation released to the market a new model of the Qwip telefacsimile machine--the Qwip II, Series 1300. This new model operates at transmission speeds of 2 and 3 minutes as opposed to transmission speeds of 4 and 6 minutes for the Qwip 1200 used during the TALINET Demonstration. Because it was the intent of the TALINET Project to evaluate state-of-the-art telefacsimile technology for library applications, and because the Qwip II offered to cut transmission times in half over Qwip 1200, the Project staff decided to test the new equipment.

A two-week test was conducted between the TALINET headquarters at the University of Denver and the Library of the National Oceanic and Atmospheric Administration Laboratories in Boulder, Colorado. The following procedure was used for the test:

1. Journal articles for daily transmission from NOAA to the University of Denver were randomly selected:

   a. Using the current NOAA list of periodicals, every twelfth title was selected for transmission.

   b. The most recent issue available of the selected title was secured.

   c. The fifth article in the selected journal was transmitted at the Qwip II's 2-minute speed.

2. A type-size test sheet was also transmitted each day.

3. The telefacsimile copy of the type-size test sheet was re-transmitted from the University of Denver to NOAA to secure second-generation copy.

4. During the second week of the test the same articles as well as the type-size test sheet were sent by 3-minute transmission time to establish comparisons.

5. On the last day of the test, pages with potential resolution problems were also transmitted by the 4- and 6-minute Qwip 1200.

6. Type-size test sheets were also transmitted by 4- and 6-minute Qwip 1200 on the last day of the test.

A copy of the transmission log maintained during the test, the type-size test sheet used, and the result of legibility comparisons among 2-, 3-, 4- and 6-minute Qwip transmission follows herewith.

COST COMPARISONS

The test period demonstrated that an average of one additional minute of transmit time is required per page on the Qwip II as on the Qwip 1200 for voice coordination of transmission, paper

(Continued on page 12)

QWIP II TRANSMISSIONS FROM NOAA TO TALINET OFFICE/WEEK OF JULY 2

Date	7/2	7/3	7/4	7/5	7/6
Number of Pages	7	2	HOLIDAY	6	4
Speed Setting	2 minutes	2 minutes		2 minutes	2 minutes
Transmission Time					
start:	9:34	9:34		9:50	9:30
stop:	10:00	9:43		10:11	9:42
Elapsed time in minutes	26	9		21	12

QWIP 2 TRANSMISSIONS FROM NOAA TO TALINET OFFICE/WEEK OF JULY 9

Date	7/9	7/10	7/11	7/12	7/13
Number of Pages	5	7	2	6	4
Speed Setting	2 minutes	3 minutes	3 minutes	3 minutes	3 minutes
Transmission Time					
start:	9:31	10:25	2:43	9:35	9:45
stop:	9:48	10:55	2:56	10:00	10:01
Elapsed time in minutes	17	30	13	25	16

TYPE-SIZE SHEET

Press Roman

UNIVERSITY OF DENVER • Department of Graphics – 11 Pt. Bold

UNIVERSITY OF DENVER • Department of Graphics – 11 Pt. Medium

UNIVERSITY OF DENVER • Department of Graphics – 11 Pt. Medium Italic

UNIVERSITY OF DENVER • Department of Graphics – 10 Pt. Bold

UNIVERSITY OF DENVER • Department of Graphics – 10 Pt. Medium

UNIVERSITY OF DENVER • Department of Graphics – 10 Pt. Medium Italic

UNIVERSITY OF DENVER • Department of Graphics – 9 Pt. Bold

UNIVERSITY OF DENVER • Department of Graphics – 9 Pt. Medium

UNIVERSITY OF DENVER • Department of Graphics – 9 Pt. Medium Italic

UNIVERSITY OF DENVER • Department of Graphics – 8 Pt. Bold

UNIVERSITY OF DENVER • Department of Graphics – 8 Pt. Medium

UNIVERSITY OF DENVER • Department of Graphics – 8 Pt. Medium Italic

Classified News

UNIVERSITY OF DENVER • Department of Graphics — 6 Pt. Bold

UNIVERSITY OF DENVER • Department of Graphics — 6 Pt. Medium

Classified News Presswire

UNIVERSITY OF DENVER • Department of Graphics — 6 Pt. Medium

Bodoni

UNIVERSITY OF DENVER • Department of Graphics – 10 Pt. Medium

UNIVERSITY OF DENVER • Department of Graphics – 10 Pt. Medium Italic

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LEGIBILITY COMPARISONS

2-, 3-, 4-, and 6- Minute Qwip Received During the Two-Week Test Period

2-Minute Mode: (Resolution = 86 lpi horizontal x 78 lpi vertical)

4 pt. subscripts and superscripts not legible
6 pt. text and footnotes offer word legibility--i.e. some letters not legible per se but in context, words are legible
6 pt. Greek characters not legible
6 pt. "thin" computer print presents some word legibility problems --has definite letter legibility problems
2nd generation copy: upper case 6 pt. bold is word legible-- 11 pt. lower case medium letter legible

3-Minute Mode: (Resolution = 96 lpi horizontal x 96 lpi vertical)

4 pt. subscripts and superscripts offer variable legibility
6 pt. text and footnotes offer nearly complete letter legibility
6 pt. Greek characters not always legible
6 pt. "thin" computer type clearly word legible, mostly letter legible
2nd generation copy: 6 pt. lower case bold, 6 pt. upper case medium offers word legibility; 10 pt. upper case bold offers letter legibility

4-Minute Mode: (Resolution = 96 lpi horizontal x 64 lpi vertical)

4 pt. subscripts and superscripts offer variable legibility
6 pt. text and footnotes offer nearly complete letter legibility with distinct horizontal lines
2nd generation copy: 6 pt. lower case bold, 6 pt. upper case medium is work legible; 9 pt. lower case bold, 9 pt. upper case medium is letter legible

6-Minute Mode: (Resolution = 96 lpi horizontal x 96 lpi vertical)

4 pt. subscripts and superscripts offer variable legibility
6 pt. text and footnotes clearly letter legible--no lines
6 pt. Greek characters still not clearly legible
6 pt. "thin" computer print clearly letter legible--no lines
2nd generation copy: 6 pt. lower case medium is word legibile; 9 pt. lower case medium, 8 pt. upper case bold is letter legible

changes, etc. This is true even though the Qwip II, unlike the Qwip 1200, has direct through-machine telephone line coupling rather than a handset coupler. Based on these actual transmission times and with other factors determined in the same manner as for the TALINET Project's use of Qwip 1200, unit costs for Qwip II may be identified as follows:

$$\text{Unit cost} = \frac{\text{(lease cost + line charges + staff costs + supplies)}}{\text{number of transactions}}$$

When:

Staff costs = $5.00/hour/person--two staff required

Supplies = 12¢/page

Average transaction = 6 pages

Overall cost formulae for Qwip II =

2-minute mode $62.00s + $9.98x
3-minute mode $82.00s + $13.02x

where s = number of transmitting/receiving sites
x = number of transactions per month

For the TALINET Project, s = 6 and x = 147; therefore unit costs for the TALINET Project, if Qwip II had been used for all transactions, would have been:

2-minute mode $UC = \frac{\$1,839.06}{147} = \$12.51$ for 6-page transaction

3-minute mode $UC = \frac{\$2,285.94}{147} = \$15.55$ for 6-page transaction

Table 1
COST COMPARISONS

	Monthly Cost Formula	Average Site Costs Per Month	Unit Costs (per 6-page transaction)
Qwip II			
2-minute mode	$ 372 + $ 9.98x	$367.81	$12.51
3-minute mode	$ 372 + $13.02x	$457.19	$15.55
Rapifax 100			
High Speed	$1,680 + $ 2.13x	$398.62	$13.56
Standard	1,680 + $ 2.96x	423.02	14.39
Fine Detail	1,680 + $ 4.52x	460.95	15.68
Qwip 1200			
4-minute mode	$ 240 + $16.06x	$520.16	$17.69
6-minute mode	240 + $22.14x	698.92	23.77

(Calculations based on five sites + one resource node, six pages per transaction, 147 transactions per month; all costs calculated as outlined above and as in TALINET Project Final Report, Section 9).

Table 1 compares the Unit costs for document delivery by the two pieces of machinery actually used in the TALINET Project and by the Qwip II. The comparison is based on TALINET costs and level of activity.

CONCLUSIONS

1. Qwip II, at the level of costs incurred and level of activity experienced by the TALINET Project would have been cost-competitive with the Rapifax 100. The Qwip 1200 was not.

2. The Rapifax 100 still yields lower unit costs for a 6-node network when volume exceeds 228 6-page transactions per month.

3. Where Express Mail Service is available, this service is still less expensive for 24-hour delivery than the Qwip II.

4. The advent of the relatively inexpensive Qwip II shows promise that telefacsimile technology may very soon offer a cost-effective rapid delivery system for the low volume of traffic experienced in the majority of U.S. libraries.

APPENDIX

TALINET--EXPLORING TELEFACSIMILE FOR LIBRARY APPLICATION

TALINET CONFERENCE

Colorado Boulevard Holiday Inn
Denver, Colorado

July 16 and 17, 1979

TALINET--EXPLORING TELEFACSIMILE FOR LIBRARY APPLICATIONS

AGENDA

Monday, July 16, 1979

9:30 - 10:00	Registration and coffee, Golden Boulevard Room A
10:00 - 10:20	Welcome: Dean Margaret Knox Goggin Introductions: Maureen Crocker and Joyce Sethre
10:25 - 11:00	"Telecommunications--Libraries and the Future," Norman Kreisman
11:00 - 11:20	Discussion--Questions/answers
11:20 - 11:50	Highlights of TALINET. Bill Kapp
11:50 - 12:20	Discussion--Questions/answers. TALINET Staff
12:30 - 1:45	Lunch, Country Kettle Coffee Shop, Holiday Inn
1:45 - 2:30	Telefacsimile cost comparisons. James Boyce
2:30 - 3:00	Discussion--Questions/answers. James Boyce and Staff
3:00 - 3:10	Conference goals for remainder of conference, Dean Margaret Knox Goggin
3:10 - 3:40	Refreshment break. Meetings by state.
3:40 - 4:40	State reports--System Updates (5-7 minutes per state--Group discussion and identification of common issues and concerns. Dean Margaret Know Goggin, Maureen Crocker, Joyce Sethre
4:40 - 4:50	Overview of day. Margaret Knox Goggin
4:50 - 5:00	Housekeeping announcements, travel vouchers
5:00 - 6:00	Social hour

Tuesday, July 17, 1979
(Golden Boulevard Room A)

9:00 - 9:10	Overview, Margaret Knox Goggin
9:10 - 9:30	New Technologies for Libraries. Dr. Joan Maier
9:30 - 10:10	Bibliographical Center for Research. Don Simpson
10:10 - 10:40	Coffee Break. Demonstration of Qwip (2-minute)
10:40 - 12:00	Development of models. Introduction and group assignments. Three groups: - State model - Regional model - Resource model
12:00 - 1:15	Lunch, Country Kettle Coffee Shop
1:15 - 2:15	Reports of Model discussions
2:15 - 3:00	Discussion of the future. Margaret Know Goggin, Discussion Leader
3:00 - 3:30	Conference detail wrap-up. TALINET Staff (Refreshment break)
3:30	Adjournment

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Denver, Colorado
July 16-17, 1979

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TELECOMMUNICATIONS--LIBRARIES AND THE FUTURE

Keynote Address
Norman H. Kreisman, President
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TALINET Conference
Denver, Colorado
July 16, 1979

A very few years ago, Arthur C. Clarke, scientist, science fiction writer, and the man who in 1945 proposed the feasibility of communications satellites, was asked what changes he thought technology would bring in 100 years. Clarke replied, that in 100 years, anyone, anywhere on earth, would be able to communicate instantly with anyone else. He or she would see the other person. Furthermore, he could have instant visual access to all recorded information, including libraries, anywhere on earth.

By now, I think, all of us realize that the system Clarke described will be a reality in much less than 100 years.

The technology necessary to fulfill Clarke's prediction exists today. No new inventions or scientific breakthroughs are necessary. While it won't take 100 years to achieve a universal interpersonal/interinstitutional communications system such as Dr. Clarke described, and while it won't be here in its entirety overnight either--many of the modular components that will be functional elements of the ultimate system are here and functioning today.

What are these developments, these subsystems which are elements of super systems yet to come? How can we, and how should we, avail ourselves of the new information delivery services offered by new technology?

We are living in a time of rapid transition in the way information is being handled. We will talk about what is going on in the electronic communications world. But first let us establish some perspective to this technological revolution in context with our own experience.

Example 1

Back in the early 1920's, when the income tax first became a factor in American life, two men, with the middle names of Prentice and Hall entered the publishing world by creating a tax manual for accountants. However, the tax law was modified by the time the book was off the press. As a case-bound book the first product of the new company was worthless and an impending financial disaster for the new firm. However, Prentice-Hall made a virture of necessity and created the first--and very successful--information service of its kind. When changes occurred in the tax laws, the subscribing accountants were mailed an updated page or chapter for their looseleaf ring binder--a very new and innovative adaptation to deal with changing information requirements of a half century ago.

Example 2

As late as the 1960's the Engineering Index was compiling and publishing titles and abstracts from technical articles in a bound volume that appeared once a year. By that time there were over 100,000 technical articles published throughout the world every month. The number has more than doubled today. (There are now thousands of scientific and technical journals published worldwide.) Obviously by the early 1960's, the Engineering Index was employing techniques that were inadequate to the needs of its professional clientele.

Example 3

My final example relates to a meeting this June at the American Library Association (ALA) meeting in Dallas. A friend from a news reference publishing company asked me to suggest vendors of information in data base format that he could contact in order to license the use of his material in electronic format. The publishers role won't change--but some of the ways his information is delivered to customers will--and new middlemen are appearing, middlemen who are warehousing inventory in electronic rather than paper form--and delivering to customers via electronic channels of communication.

The three examples, in publishing, help illustrate an important principle of technological change: if you make a graph of the rate of change, it seems to take forever for growth to start; suddenly, the curve starts to approach the vertical and growth becomes explosively rapid. As time goes by, more and more information is being stored in computer controlled memory devices. These computer systems can communicate the information they contain to other computers or display devices or printing equipment wherever there is a telephone or an antenna. (By the way, I did not limit that last remark by saying "wherever in the world there is an antenna"--witness the video pictures from the moon, and the planets.)

The number of data bases stored on-line in computers today is growing rapidly. Libraries (or individuals and other institutions) can, for a price, access that information. The services that provide computerized bibliographical information to libraries or groups of libraries are expanding. Key words for meaningful modern electronic information systems are "current" and "up-date," and "fast access."

Within the time frame of 3-5 years, every library in the United States with a reference department worthy of the name will have on-line electronic terminal access to computerized card catalogs, bibliographic data bases, and to data bases which support and provide update for conventional reference materials--and the trend toward total electronic storage of new publications will be well underway. This is not a bold prediction. The questions we should be addressing are: when, how, and to what extent one gets involved; what institutions and organizations will provide the services; and to whom.

Before we address the when, how, and what vis a vis your future with telecommunications, I would like to take a minute to make a point about computers and graphic arts typesetting that will support my contention that total electronic storage of a significant portion of published material is coming--sooner than many expect. We have reviewed the role of the computer in information storage and communication, and noted that computers are connected with one another, as well as with

terminal devices, by electronic linkages. However, there is another computer process that will have major impact on the proportion of published information that will be telecommunicated to libraries. The computer has become an integral component of modern typesetting systems. It provides commands to a variety of typographic devices, some small and relatively simple, some extremely complex and powerful. But regardless of the nature of the computer-driven hardware, before the type can be "set," all of the information to be set in type must be input into computer memory first. Therefore--you guessed it--the information can be conveniently retained for future access. This pre-stored type will have a major positive impact on the economic advantages of storing "books" in data banks. The rule rather than the exception will become--typeset information will be retained in data base format. However, a corollary of import to libraries can be best stated as a question--how much computer stored "type" should be printed out in complete book form? One answer: the small fraction needed at any time while the rest remains conveniently accessible to the remote consumer on a demand basis. This idea is merely a first cousin to the computerized card catalog concept but is a distant cousin to a data bank compiled from pre-existing printed materials. An ever growing proportion of recorded information will be stored remote from libraries.

How do library personnel prepare themselves to get involved? This happens in one of two ways: personal to institutional; or institutional to personal. The sequence depends on whether you are someone who implements innovation in your library, or vice versa. Because of your involvement with TALINET I can safely assume the innovation begins with you.

To become familiar with the services delivered by telecommunications that are available now and becoming available, you really have to do your homework. By that, I don't mean learning a list of terms such as facsimile, remote data base, computerized bibliography service, and time-shared computer network. I do mean that you must find out what the market has to offer. You must become familiar with what the various services offer, how they compare qualitatively and quantitatively to each other, as well as to your existing services. Then, when you know all this, you can then determine the cost. But the cost is not merely a simple dollar cost at the bottom line of a column of figures. True, cost is a major factor. But as a provider of information services to a growing population of information consumers, you will need to make informed value judgements about information intangibles such as speed of acquisition, enhanced availability, and the added value of current information.

When you have determined for yourself the value of the services you are investigating, the information you have gathered becomes the basic data you need to justify the changes in your library. Having these facts won't make the implementation of services take place automatically. We all know that. You have organizational constraints, political factors, competition for tax dollars, and so on. But the data I referred to, the facts relating to cost-effectiveness and value related information needed to answer questions that will be asked, and should be asked, are <u>prerequisite</u> to moving ahead.

Remember there are resources available to help you. For a smaller library, the state or the regional library is your resource for many new services as well as for consultation about new telecommunications services. A central library system may call upon a library consortium, or network. The Library of Congress will continue to expand its services to the national library community.

How can you get regional participation? Involve a consortium of libraries? In principle it's simple--convince your regional colleagues of the value of the telecommunications oriented services in the manner in which you convinced yourself and your institution. Then demonstrate the economic advantages of combining regional resources, to take advantage of sharing the economies of scale. The various vendors of the services you consider purchasing will be glad to provide information--which should be examined cautiuosly. We know that what is simply stated in principle can take an awful lot of doing in practice. But it seems to me, that when a group as distinguished as this, for example, with its reputation of delivering quality library services--economically and effectively to a broad range of clientele--leads the way, others are sure to follow your lead.

Where are we in our journey to the Clarke millenium? Today you have the TALINET scenario. Bibliographic information in data bases is accessed directly from a terminal at the point of inquiry or from an intermediate library or service organization. The various source documents determined to be relevant to the needs of the individual initiating the inquiry are identified by titles and location or locations. This is fairly straightforward in terms of how computer data bases are queried, from remote terminals, via telephone networks. The manner in which it becomes practical for the libraries responding to a request for full copies of papers, articles, and documents will depend on a number of factors, including the copyright laws, the transmitting speed of various facsimile devices over telephone lines, trade-offs between productivity and costs of various equipments. The simplest and cheapest fax machine sends one 8½ x 11 page in four to six minutes (at the cost of a four or six minute call) over voice grade telephone lines. Thre are more sophisticated fax machines that will send a document in 20 seconds--and these devices will be more economical if the traffic is heavy enough.

However, the real barrier to be overcome--which is in the process of being overcome--and will be overcome in the next three to five years, is the limited information carrying capacity of telephone lines. There is a limit to the savings that can be achieved in telephone transmission--regardless of the sophistication of the facsimile terminal device. The solution lies in the enormous information carrying capacity of communications satellites. You don't have a satellite earth station antenna on your roof? (Yet?) Your volume of traffic doesn't warrant that kind of transmission equipment? (Yet?) Well, not to worry. There is a new dimension to electronic mail. Telecommunications carriers are gearing up to address the market for satellite telecommunications services. Common carriers such as AT&T, RCA, the Comsat-IBM-Aetna consortium (SBS) and others. But, (you won't believe this), the vendor of the satellite mail service which is initially most likely to be practical for libraries will be the U.S. Postal Service!

From a press release dated June 7, 1979--"The Postal Service views the application of evolving technology in the field of electronic communications as another logical step in its continuing efforts to provide improved levels of mail service needed by the public at a reasonable cost."

In the present Postal Service scenario, you local post office will hand deliver the facsimile pages it receives locally. There is no proposal to compete with common carriers for terminal to terminal "mail."

Will the day come when there will be communication from library to library by satellite? Yes. Will ultra high speed transmissions of complete chapters or documents be economically feasible? Yes. When will that day be here for your library? When you determine that it has become more economical

to get information today rather than tomorrow. What does "economical" mean in this context? Not merely cheaper. We are back to value analysis again. Although the day will come when direct to you transmission costs will be less expensive than slower, more indirect methods, one simply may not want to wait for that time to come because of the value added advantages of being directly on-line.

However, there is not much of an advantage in a system that instantly delivers the facsimile of an article, ordered by electronic methods, if it takes two weeks for reproduction to take place before sending. Your TALINET program has produced some very interesting data on total fulfillment time, which you will be hearing more about. Service remains, and will remain, a very important role for the resource library staff.

Let's go back briefly to computer typesetting. Digital information, the kind stored in, and communicated from, computers is transmitted more efficiently than fax. Much more information can be sent in a unit time. The amount of information being created is doubling every decade, or less. A growing proportion will remain stored in computer compatible format. The time will come when most information transmitted to remote consumers will be in digital rather than fax format--in other words, directly from information stored in computer managed binary coded memory devices rather than from images of pages.

But facsimile or digital, we are embarked on a journey to the economic feasibility of roof-top antennas, economical electronic storage, excellent retrieval, transmission and display systems, and low cost electronic mail for libraries. Fortunately for all of us, this journey is continuing and never ending.

I hope you enjoy the trip.

Thank you.

A BAKER'S DOZEN OF TELECOMMUNICATIONS TECHNOLOGIES:
Capsule Descriptions for the Layman

Television, radio, the telephone: these technologies are well known to us, at least in their more ubiquitous forms. When we think of options for delivering health, education, and other social services these, and other garden-variety telecommunications technologies, are likely to come to mind. We know that in the proper circumstances these technologies can be effective: for Sesame Street, or for emergency medical services communications, or for transmitting social security data, to choose a few obvious samples. In the area of program support, use of the telephone is so common and effective that to do without it would be a real problem.

The baker's dozen of technologies briefly described on the following pages are less well-known to most people, even though several are 15 years old, or more, and are well established, reliable forms of communication. A few are still in the developmental stage, such as slow scan television, or teletext. All are part of the constantly growing array of telecommunications technologies offering social service managers a greater opportunity to select a tool to fit their precise needs.

Our ability to use these tools wisely depends upon having a reasonable understanding of what they do, and how they work. These few capsule descriptions are a useful starting point, and together give a good sense of the breadth of what is currently available. We hope that these descriptions will convince you that most of the concepts involved are surprisingly easy to understand, even for the nontechnically minded.

HEW Telecommunications Policy Office
June 1979

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AUDIO TELECONFERENCE

Audio teleconferencing is one means for people located at a distance from each other to carry on a meeting. Improved equipment has made possible high quality and audio teleconferences with as many as 45 locations simultaneously on the line, able to listen and talk. A teleconference this large is unusual, and calls for meticulous planning. But the fact that sound quality can be excellent in such a large teleconference, even one with participants as far removed as Honolulu, Hawaii and Washington, DC, demonstrates the medium's potential for bringing together large groups of widely dispersed people.

Standard telephones, or speakerphones (for hand-free operation), can be used. Where only a few locations are involved, with one or two people at each location, such standard telephone equipment is probably all that is needed, and the call can simply be set up through the FTS operator.

However, when more than a few people will be involved from one site, or when many sites are to be included in the meeting, more sophisticated equipment is called for. Such audio conferencing equipment generally contains a speaker, several microphones, and some type of switching mechanism to turn the microphones on and off. (Often the microphones are voice-actuated; that is, they are "off" until someone speaks into them. This technique provides higher quality sound by eliminating much of the background noise.)

The telephone connections which make the teleconference possible are made through a device known as a "bridge." Commonly, the bridge is manned by an operator, who places the phone calls, and adds participants to the conference one by one. One type of bridge, the so-called "meet-me bridge," allows participants to call a designated number (at a pre-determined time), and thereby automatically become part of the teleconference.

Research and development in this area is very active. Improvements in equipment, and more aggressive marketing efforts, are to be expected.

VIDEO TELECONFERENCING

In the use of teleconferencing, one can accomplish a great deal using audio alone, or the computer, or audio with some graphics capability (such as facsimile transmission of documents). Full motion video--in effect, closed-circuit televisison-- is probably only necessary for a small fraction of all teleconferences. This is fortunate, considering that such video capability, particularly if it is two-way, is generally very expensive.

Video transmission requires the equivalent of about a thousand telephone lines. This is likely to be expensive even if microwave, or some other such link, replaces actual pieces of cable or wire. (Bell's "Picturephone" requires less capacity--but still hundreds of times more than a standard telephone.)

Nonetheless, there are certain applications--in business, medicine, and elsewhere--for which video teleconferencing makes sense. An extreme example might be in remote areas of Alaska, where travel is difficult or impossible.

At present, video teleconferencing systems tend to be one-of-a-kind installations, often based on microwave links. For the future, a satellite-based commercial teleconferencing service, whose capabilities will include full-motion video, is under development by Satellite Business Systems (SBS), which is jointly owned by Comsat, IBM, and Aetna Life and Casualty Co.

COMPUTER CONFERENCING

Computer conferencing allows people at different locations to exchange typewritten messages through a computer, even though the individuals may not be connected to the computer simultaneously, and even when the location of the individuals is unpredictable (and possibly unknown). A typical computer "conference" generally takes place over a period of days or weeks.

The computer provides a sort of electronic mail system, in which messages are delivered to "mailboxes" in the computer, where they are stored. Participants check their mailboxes periodically, as one might check a message board at the office. They can respond to items of interest by composing typed messages which are almost instantaneously deposited in the "mailboxes" of those to whom the message is addressed.

Obviously, participants will require access to a computer terminal, which may or may not be portable. Terminals have keyboards resembling ordinary typewriters, and use either a television-like screen or paper for displaying text. Through standard phone lines the terminals can be connected to a central computer. Thus, participants might be located virtually anywhere in the world.

A participant will call the computer, identify him- or herself (via account numbers and passwords), and then use typed commands to get the mail in their mailbox typed at their terminal, or to send a message. a session at the computer terminal can last from a minute to two hours, depending on the work to be done. A typical session might last ten minutes, and be repeated every one or two days.

Some commercial computer conferencing systems are especially designed to facilitate communications among a group (for example a group of State legislators working on a common problem). Other systems are designed primarily for communications between individuals through the computer. Nonetheless, there are many similarities.

Wide variations exist in the features offered by different vendors. But as a rule, compared to doing the same task by hand, the computer makes it easier to edit text, to store and retrieve old messages, to distribute "carbon copies," and to do various other routine functions.

SLOW SCAN TELEVISION

The impression of slow scan television is of a series of still pictures being transmitted and received through standard phone lines. The transmission of moving pictures by this technique is generally not feasible.

The reason why is as follows. Normal television images are transmitted and received 30 times per second. The illusion of motion depends on this rapid replacement of one still image by another.

The telephone line is too small an "electronic pipeline" through which to send so much data so quickly.

If we send about one one-thousandth as much data in the same length of time the phone line is adequate. Thus a television image can be transmitted about once every 30 seconds. (The exact frequency will depend on the amount of detail needed in the image, the size of the screen, the equipment manufacturer, and so on.)

Slow scan is a relatively new technology in the commercial marketplace. For this reason, the range of applications for which it is useful is still being explored. For example, demonstrations are currently underway using a slow scan television in education (e.g., for prisoners in Cook County, Illinois), for medical applications (especially in rural counties), and for information dissemination (e.g., among libraries and hospitals). Large businesses are also investigating uses of slow scan.

FACSIMILE

Facsimile, or "fax," is a means of reproducing documents at a distance. Facsimile systems which are telephone-based are of particular interest, since they can be installed so easily.

In contrast to electronic mail, or computer conferencing systems, facsimile is generally not based on coding individual characters, one at a time, and transmitting them. Rather, a typical fax system scans across the page, transmitting codes for light and dark patches. Characters (e.g., letters of the alphabet are built up from a number--perhaps several dozen--light and dark patches. This method is significantly slower, but has the advantage that any figure can be reproduced: line drawings, signatures, and special symbols, for example.

Commercial facsimile systems vary widely in price, speed, operating procedures, and the like. As a general rule, however, there is a trade-off between speed (from six minutes per page to less than one minute) and resolution.

THE ELECTRONIC BLACKBOARD

Devices to reproduce handwriting at a distance have been in use since befor the turn of the century. One of the sensations of the 1893 World's Fair in Chicago (the Columbian Exposition) was Elisha Grey's "Telautography."

The Electronic Blackboard is essentially an improved version of this old device. A blackboard surface sensitive to pressure is used. Whatever is drawn or written on the blackboard is transmitted over phone lines, and reproduced, as a television image, at the receiving end. More than one site can receive the information.

The Electronic Blackboard is available through the telephone company.

TTY (Teletypes for the Deaf)

Alexander Graham Bell was profoundly interested in the problems of deafness, and originally undertook his research on the telephone as an outgrowth of that interest. It is strangely ironic

that, rather than emancipating the deaf, the development of the telephone further cut them off from the world of the hearing.

This situation did not improve until 1964, when a deaf engineer and a deaf orthodontist devised a system of communicating over standard phone lines, using teletype equipment coupled to the phone through a "modem." Information typed at one end is instantly reproduced at the other end of the line.

Originally, the deaf community used, almost exclusively, reconditioned equipment donated by the telephone company, and other companies. These machines are large, noisy, and use many moving parts (and so are subject to frequent malfunctions). While many of these are still in use, new solid-state electronic devices are currently available which are portable, and more reliable than the older machines.

Estimates of the number of TTY devices used by the deaf community vary widely. The figure is roughly several tens of thousands. Unquestionably, this is a very small fraction of the millions of deaf and hearing-impaired people in the U.S.

The devices used by the deaf are based on the old Baydot (5-level) code. A debate is currently taking place (e.g., at the FCC) as to the desirability of changing over to modern ASCII (8-level) code. ASCII is the code used by most computers and computer terminals. As the personal computer/video game market swells, the question of compatibility may become a more serious one for the deaf.

Experiments in using computer-assisted telecommunications (CAT) for the deaf are underway, sponsored by the Telecommunications Policy Office and by the Bureau of Education for the Handicapped. CAT offers the possibility of many additional services of particular value to the deaf, as well as the benefits (e.g., message storage) which apply equally to hearing persons using CAT. (See the section on computer conferencing.) The question of compatibility of old and new terminal types is being investigated under the BEH grant.

CLOSED CAPTIONING OF TELEVISION (for the Deaf)

Secretary Califano announced several months ago that final agreement had been reached among HEW, PBS, NBC, ABC, and Sears to make closed captioning available beginning early next year. This significant milestone for the deaf and hearing-impared is based on extensive research and development sponsored jointly by HEW and PBS.

Closed captioning works as follows. Invisible, inaudible signals will be transmitted along with the normal signal, for a variety of network programs. Special decoder units, to be sold by Sears, will decode the added signal and display it, in the form of captions at the bottom of the screen. Normal reception for those without decoders will be completely unimpaired. A royalty of $8 on each decoder sold will help make closed captioning a self-sustaining operation.

The ancillary signals fit in the vertical space between frames--off the top of the screen, so to speak. Because they are encoded on the 21st line of the 525 lines that makeup a full picutre, the system is sometimes known as Line 21.

TELETEXT AND VIEWDATA

The teletext is similar to closed captioning, described above, in that invisible, inaudible signals are added to an otherwise normal television broadcast. Those owning special decoder units (which might eventually be built into most television sets) are able to view the additional information.

In this case the auxiliary information consists of a large number (100-1,000) of "pages" of data: weather maps, stock quotations, community bulletin boards, or what have you. To use teletext, one turns the decoder on and specifies (by pressing buttons) which page one wishes to view. After a few seconds delay, the selected page appears on the television screen. (The first one or two pages might index the others.)

Great Britain, West Germany, France, and several other countries are quite advanced in experiments with teletext. In the U.S., several experiments are underway (in St. Louis and Salt Lake City), and in ther near future another will be run by WETA here in Washington. The latter is being planned by the Alternate Media Center in N.Y.U. Ideas for the most useful ways in which to apply teletext are still being sought by them.

A related system, known as viewdata, is also being developed. In this system, "pages" are displayed on a television receiver, as in teletext. However, the information, rather than being broadcast, is sent over normal phone lines from a computer to the decoder attached to the television. As a result, a much larger amount of data can be made accessible--hundreds of thousands of "pages," or more. And, because the connection is two-way, viewdata systems can be interactive in a way that teletext systems cannot be.

Finally, it should be pointed out that the terminology used for these systems is confusing. "Teletext" and "viewdata" are generic terms, like "cola." Every particular instance will have its own proprietary name (e.g., Ceefax, or Antiope). Worst of all, the generic terms themselves are not yet universally accepted.

SUBCARRIER (SCA)

Have you ever wondered how Muzak is transmitted to the hotel, restaurant, or other facility where you hear it playing? Often the means of distribution is the subcarrier of a commercial FM station.

The band of frequencies allocated to a television or radio station is actually somewhat larger than necessary, in part to provide a margin of safety so that there is no interference with the other stations' signals. It is possible to "squeeze in" another audio signal, and this auxiliary signal is known as a subcarrier.

A special device is needed to receive the subcarrier signal. In the case of FM radio, the device costs about $55, and the subcarrier service is called SCA (for "subsidiary communications authority").

The special receivers are not generally available to the public; special arrangements must be made. For example, to receive Muzak, the device must be rented or leased from the distributor.

Because the audience is restricted--the signal is not accessible to everyone--SCA is classified as a "nonbroadcast" telecommunications technology.

At least 50 public radio stations across the country use SCA to provide special programming to the blind, the deaf, or other special populations. In such cases the special receivers may be made available through the station, or through a local nonprofit organization. SCA services include talking books for the blind, and "radio for the deaf" (in which the signal activates a teletype or similar device in the deaf person's home).

"Radio for the deaf" illustrates the fact that information other than voice or music can be transmitted via subcarrier. Essentially, any information that can be carried over standard audio phone lines--such as facsimile, or slow scan television, or computer data--can be transmitted via subcarrier.

Research is currently underway (through Centex, in Williamsburg, Virginia) to allow several types of data to be transmitted simultaneously using a single subcarrier. If technical and financial problems are surmounted, it might then be possible, for example, to transmit talking books and "radio for the deaf" simultaneously on the same subcarrier, without interference.

INSTRUCTIONAL TELEVISION FIXED SERVICE (ITFS)

The FCC has set aside a certain portion of the broadcasting spectrum for use by educational organizations. Twenty-eight channels in the 2500-2686 megahertz range are reserved to be used "primarily for the transmission of visual and aural instructional, cultural, and other types of educational material to one or more fixed receiving locations." Hundreds of such channels are currently licensed.

Receiving sites require special antennas and other equipment (downconverters). Since the public at large cannot receive ITFS froadcasts, use is restricted to participating institutions, generally educational.

Some latitude is possible. "Such stations may also be used for the additional purpose of transmitting visual and aural material to select receiving locations for in-service training and instruction in special skills and safety programs, extension of professional training, informing persons and groups engaged in professional and technical activities of current developments in their particular fields, and other similar endeavors."

CABLE TELEVISION

About a fifth of this nation's households now subscribe to cable television, and the proportion is increasing. Cable's growth has been stimulated by, among other things, satellite distribution of programming (see next page).

In addition to offering a large and diverse array of standard television programs, movies, and such fare, cable technology also provides communities with alternatives for other services.

Many localities have required the local cable company to set aside channels for city government and/or education. For example, Arlington County has recently allocated four channels to the schools. Such a large capacity may mean that the fixed and rigid broadcast schedule, which in the past has been a serious barrier to use of educational television, can be circumvented relatively cheaply. There are other possibilities as well; in the City of Spokane, Washington, which has set aside five channels for the schools, a "community health education consortium" has been established to take advantage of the available channels.

The capability of cable to be used for interactive (two-way) applications has been implemented in a variety of ways. On the commercial side, Warner Cable has established its well-known QUBE system in Columbus, Ohio. Eighty-six percent of Warner's 35,000 subscribers there purchase QUBE. By pushing buttons attached to the television, viewers can participate in game shows and public opinion polls, request further information from local advertisers, and so on. Warner is planning to establish similar systems in Houston and Cincinnati.

On the noncommercial side, the National Science Foundation has sponsored three successful demonstrations of two-way cable; in Rockford, Illinois; Spartanburg, South Carolina, and Reading, Pennsylvania. Each demonstration explored one or more social service applications, such as training teachers and firefighters. The Spokane system mentioned above will also have a two-way capability.

A final example of an alternative use of cable television is the development, by Jerrold Electronics and Mattel of "Play Cable," a commercial "network" devoted to games and education. Use of this channel will require a special terminal, most likely a hybrid of video game and computer.

SATELLITE NETWORKING

To a greater extent every year, communications satellites (e.g., Wester and Satcom) are being used to transmit entertainment, educational, and cultural programs nationwide.

Both the Public Broadcasting Service and National Public Radio will shortly be distributing virtually all their programming by satellite. Each will have multichannel capacity, so that local stations will have a greater degree of choice of what to broadcast than ever before. The networking of SCA nationwide (e.g., talking books for the blind, or teletype radio for the deaf) is a real possibility.

Cable television "networks" are growing. These include subscription services, such as Home Box Office, and "super-stations," which seek national distribution in order to increase their advertising base. C-SPAN, the Cable Satellite Public Affairs Network (which distributes live coverage of Congress), is another cable channel distributed via satellite.

An educational "network" expected to be distributed by satellite in the near future is the Appalachian Education Satellite Program, AESP, which will no longer be limited solely to Appalachia, has specialized in continuing professional education.

VIDEO TELECONFERENCING

Strengths

- Meetings are satisfactory for a wide range of typical business communication tasks, but are particularly valuable--compared to nonvisaul media--for complex communication situations.
- Video is more effective than nonvisual media for tasks which stress interpersonnel communication.
- The visual capabilities inherent in video systems are important advantages for some types of group communication.
- Video meetings are orderly, but not necessarily hierarchical.
- New users tend to respond positively to video.
- Video meetings may be more "persuasive" than meetings via other media.

Weaknesses

- Video meetings are not perceived as satisfactory for communicating with strangers or people of different ranks; furthermore, they may not be necessary for many tasks for which they are satisfactory.
- While better than audio for some interpersonnel tasks, video meetings may not match the quality of face-to-face meetings.
- Some of the characteristics of video may be perceived as disadvantages by the users.

COMPUTER CONFERENCING

Strengths

- The print mode provides some advantages over the spoken word of other media.
- Computer conferencing increases continuity of communication by making it less dependent on time and space.
- It is possible to get a sense of interpersonal interaction with computer conferencing.
- Computer conferencing is particularly well suited to tasks involving the management of technical information.

- Computer conferencing promotes equality and flexibility of roles in the communication situation.

- Computer conferencing can be used by people without highly specialized skills.

Weaknesses

- The written communications inherent in computer conferencing are less efficient than other media.

- The self-activated nature of the medium may inhibit its use.

- The communication process in computer conferencing is very demanding.

- The sense of interpersonal interaction is sometimes weak in computer conferencing.

AUDIO TELECONFERENCING

Strengths

- Audio meetings are adequate for a number of typical business and research situations; they are particularly satisfactory for communications tasks which stress information exchange and problem-solving.

- In intense communication situations, such as bargaining or negotiation, audio meetings may offer subtle advantages to some participants.

- Audio permits rapid communication, with less travel.

- Audio permits accurate communication.

- Audio promotes controlled participation.

Weaknesses

- Audio meetings are not satisfactory for tasks which stress interpersonal communication, such as negotiation or getting to know someone.

- Audio can create an impersonal, uncooperative communcations environment.

- Audio may be less productive than other media.

- Audio meetings are personally demanding.

- Users typically have negative expectations about audio.

FACE-TO-FACE CONFERENCING

Strengths

- Face-to-face meetings are particularly important for intense, interpersonal communication tasks.
- Face-to-face meetings promote greater information exchange than audio or video.
- Face-to-face is a "friendly" medium.
- Face-to-face is more "commanding" than other media.
- People generally prefer face-to-face to other media.

Weaknesses

- While face-to-face is preferred for many communication tasks, it may not be necessary.
- The "personal" nature of face-to-face may inhibit communication in some situations.

Information for this summary was found in The Camelia Report, Robert Johansen, et al., Institute for the Future, 1977.